# CLOSURE CAP FOR A MOTOR VEHICLE RADIATOR

The present invention relates to a closure cap for a fixed neck of a container, in particular of a motor vehicle radiator, as generically defined by the preamble to claim 1.

In one such closure cap, known from German Utility Model DE 202 01 082 U1, the pressure-transmitting element by means of which the diaphragm is activated as a pressure- controlled drive for the torsion preventer, is passed axially centrally through the valve assembly in the inner cap part. This causes problems, not only with regard to designing the overpressure valve body but also with regard to the position of the underpressure valve body of the valve assembly. The overpressure valve body must be guided along the pressure- transmitting tube, which makes for a quite voluminous radial size of the overpressure valve body. As a result, there is no space for the underpressure valve body either centrally or eccentrically in the overpressure valve body. The underpressure valve body in the known closure cap is therefore integrated with the torsion preventer and the diaphragm, which is problematic both structurally and technically.

The object of the present invention is therefore to create a closure cap for a fixed neck of a container, in particular of a motor vehicle radiator, of the type defined at the outset which despite a directly pressure-controlled drive by means of a diaphragm can be designed in a less complicated way.

For attaining this object, in a closure cap for a fixed neck of a container, in particular of a motor vehicle radiator, of the type defined at the outset, the characteristics recited in claim 1 are provided.

By the provisions according to the invention, not only is a more-uniform pressure distribution over the area of the diaphragm drive attained, but also, the entire valve assembly can remain inside the inner cap part and in the cap axis. This is favorable both structurally and in terms of production.

For another improved distribution of the pressure transmission from the container interior to the diaphragm drive, the characteristics of claim 2 may be provided.

With the characteristics of claim 3, it is attained on the one hand that the diaphragm, which is intrinsically fastened in fixed fashion, can serve as an axially movable drive, and at the same time, sealing of the container interior from the outer environment occurs. It is expedient in this respect to provide the characteristics of claim 4.

A direct activation of motion of the diaphragm is obtained whenever the characteristics of claim 5 are provided.

Advantageously, the characteristics of claim 6 are provided in order to achieve a reduced fluidic stress on the diaphragm and on its annular bead.

With the characteristic of claim 7, a structurally simple torsion preventer is attained, which is favorably subjected to motion and is guided upon axial motion.

Other advantageous features will become apparent from the characteristics of one or more of claims 8 through 10.

Further details of the invention can be learned from the following description, in which the invention is described and explained in further detail in terms of the exemplary embodiments shown in the drawings.

Shown are:

Fig. 1, in a schematic view in longitudinal section, a closure cap for a motor vehicle radiator in the state of repose, in a preferred exemplary embodiment of the present invention; and

Fig. 2, a view corresponding to Fig. 1, but in the activated state of the closure cap.

The closure cap 10 shown in the drawing in a preferred exemplary embodiment has an overpressure/underpressure valve assembly that has an overpressure valve body 12 and a underpressure valve body 13 which are integrated with one another and disposed concentrically to one another. The opening pressure of the overpressure valve body 12 is fixedly set by means of a helical compression spring 44, and the opening pressure of the underpressure valve body 13 is likewise fixedly set by means of a

helical compression spring 54. The valve assembly 12, 13 is disposed inside an inner cap part 15 of the closure cap 10.

The closure cap 10 furthermore has an outer cap part 16, which is composed of a closure element 17 and a grip element 18 fitting over the closure element. The closure element 17 here has the form of a female-threaded element for screwing the closure cap 10 onto and unscrewing it from the opening in a neck 11 of a motor vehicle radiator 50 or other container. The inner cap part 15 is retained on the closure element 17 in such a way that it is axially suspended on the inside and is rotatable relative to it. The grip element 18 can be adjusted rotatably relative to the closure element 17 by means of a torsion preventer 19 or connected nonrotatably to the closure element. A drive 14 for the decoupling or coupling motion of the torsion preventer 19 is disposed below the torsion preventer and above the valve assembly 12, 13 inside the inner cap part 15.

The torsion preventer 19 has a cuplike element 21, which on its upper free edge 2 has diametrically opposed radially outward-extending coupling ribs 22. It is understood that more than two radial coupling ribs 22 distributed uniformly over the circumference may also be provided on the upper edge of the cuplike element 21. The cuplike element 21 is retained between the grip element 18 and the closure element 17. The closure element 17 has a false bottom 23, through whose central bore 24 the cylindrical part of the cuplike element 21 protrudes. Adjacent to its central bore 24, the closure element 17 is provided with two diametrically opposed radial coupling grooves 26, which are engaged or can be engaged by the radial coupling ribs 22. It is understood that the number of coupling grooves 26 matches the number of coupling ribs 22. The coupling ribs 22 of the cuplike element 21 furthermore engage suitable receiving grooves 27 of an extension 28 that protrudes axially from the inside of the grip element 18. The coupling grooves 26 and the receiving grooves 27 are open in the axial direction toward one another and merge in aligned fashion with one another. The axial dimension of the receiving grooves 27 matches the axial dimension of the coupling ribs 22, while the axial dimension of the coupling grooves 26 is less than, for instance being half of, the axial dimension of the coupling ribs 22. Between the inside of the bottom 20 of the cuplike element 21 and the inside of the grip element 18 inside the extension 28, a compression spring 29 is radially fixed on its ends and retained such that it is prestressed in the axial direction. The compression spring 29 causes the torsion preventer 19 and the cuplike element 21 to be retained in the position of repose shown in Fig. 1, in which, because the coupling ribs 22 engage both the coupling grooves 26 of the closure element 17 and the axially aligned receiving grooves 27 of the grip

element 18, a rotationally fixed connection is attained between the grip element 18 and the closure element 17. In this way, the closure cap 10 can be unscrewed from the neck 11 and screwed onto the neck 11.

The drive 14, in the form of an axially movable diaphragm 31, is disposed below the bottom 20 of the cuplike element 21. The diaphragm 31 has an annular outer edge 32, which is retained in fixed fashion in the inner cap part 15. To that end, the outer edge 32 of the diaphragm 31 is retained in pressure-tight fashion between an annular face end 33 of the inner cap part 15 and an annular face 34 of a retainer 35. The retainer 35 is firmly retained both radially and axially inside the inner cap part 15. The retainer 35 is approximately hood-shaped, and its top wall has a bore 37 which is penetrated by the bottom end of the cuplike element 21. The diaphragm 31 furthermore has a circular, flat inner plate 38, which is joined integrally via an annular bead 39 which protrudes axially remote from the torsion preventer 19. Because of the annular bead 39, the inner part 38 of the diaphragm 31 is movable in the axial direction relative to its outer edge 32. A pressure disk 41 is placed without substantial play between the inner part 38 of the diaphragm 31 and the bottom 20 of the cuplike element 21.

The inner cap part 15 has an upper cylindrical part 42, whose graduated or undercut outer circumference serves on the one hand to provide the suspended disposition in the closure element 17 and on the other to receive a sealing ring 43 relative to the neck 11 of the container 50. The upper, larger-diameter cylindrical part 42 is adjoined integrally by a lower cylindrical part 45, in which the valve body assembly 12, 13 is retained axially centrally and which on its lower end is provided, on the outer circumference, with a groove for receiving a further sealing ring 46 for sealing off from the container neck 11. At the transition between the upper and lower cylindrical parts 42, 45, the retainer 35 for the diaphragm 31 is fixed in an axial annular groove.

In the wall of the lower cylindrical part 45, two or more axial conduits 47 of a pressure-transmitting arrangement 48 are provided, distributed over the circumference. The pressure-transmitting conduits 47 in the lower cylindrical part 45 of the inner cap part 15 discharge at one end opposite the annular bead 39 of the diaphragm 31 and on the other on its free end and thus into the neck 11 or in other the container 50 provided with the neck. The axial pressure- transmitting conduits 47, in the exemplary embodiment shown, are shaped slightly conically, and the end with the larger inside diameter is opposite the annular bead 39 of the diaphragm 31. Thus the pressure transmission from the container 50 to the drive 14 and thus for activating the torsion

preventer 19 is independent of the activation of the valve body assembly 12, 13. In other words, if in the container closed by the closure cap 10 a pressure builds up which exceeds a defined internal container pressure allowable for unscrewing the closure cap 10, then the pressure is transmitted to the diaphragm 31, so that its plate 38 lifts counter to the action of the compression spring 29 and thus moves the torsion preventer 19 and the cuplike element 21 axially toward the grip element 18. As a result, the coupling ribs 22 become disengaged from the coupling grooves 26 of the closure element 17, as is shown in Fig. 2. It is thus assured that at a corresponding pressure increase, the coupling 22, 26 between the grip element 18 and the closure element 17 that is fixed against relative rotation has been released, which means that the grip element 18 rotates idly relative to the closure element 17, and unscrewing the closure cap 10 is thus made impossible.

Not until the internal pressure in the container 50 has been returned to a normal or in other words allowable amount is the torsion preventer 19 or the cuplike element 21, by means of the compression spring 29, put back into the position of repose and thus into the coupled state of the grip element 18 and closure element 17.

The overpressure valve body 12 is located inside the lower cylindrical part 45 of the inner cap part 15 and is braced sealingly in the state of repose by a lower sealing face 51 on an annular sealing face 52 of an internal protrusion in the inner cap part 15, under the influence of the compression spring 44. The compression spring 44 is braced in a prestressed manner on a retaining disk 53, which is placed axially fixedly underneath the diaphragm 31 in the receiving opening in the lower cylindrical part 45 of the inner cap part 15. Axially centrally inside the overpressure valve body 12 is the underpressure valve body 13, which in the state of repose is braced sealingly by an axially upward- pointing annular face 56 on the lower sealing face 51 of the overpressure valve body 12, because the compression spring 54 is prestressed between the bottom of the overpressure valve body 12 and a head 57 of the underpressure valve body 13 that protrudes through the overpressure valve body 12. The overpressure valve body 12 and underpressure valve body 13 communicate with the container interior via a bore, so that for protecting the container 50, both an overpressure that is above a set limit value and a corresponding underpressure in the container 50 can be lessened by suitable activation of the applicable valve body 12 or 13.